

needed nutrients. Alternatively, single puddling males may be at sites with lower concentrations of the needed resources.

We have observed five cases of puddling by female *P. glaucus* at a study site near Cooperstown, Otsego Co., N.Y. In all five cases, the females were puddling singly. The first observation was at 1050 h on 22 June 1983 (day 16 of the brood). A fresh female was captured while puddling on damp soil in a vegetable garden, where she had been settled for about two minutes.

Three observations all occurred on 13 June 1984 (day 10 of the brood). At 1045 h, a fairly worn female was disturbed while puddling on damp soil at the edge of a road. She flew to the end of a nearby cornfield where she puddled in two different locations for a total duration of about five minutes. This female was subsequently captured while nectar-feeding. At 1230 h, a fresh female flew slowly along a different road edge. She landed once, probed at the soil, then continued down the road. Finally, at 1620 h, a slightly worn female was seen taking off and landing several times along the road edge, probing the soil at least once.

The fifth observation was at 1627 h on 2 June 1985 (day 17 of the brood). A very worn female was observed taking off and landing at several different spots on the soil of the vegetable garden and was subsequently captured after she had been puddling for about three minutes.

Papilio glaucus is a highly vagile, wide-ranging species. Both sexes show very low recapture rates in mark-recapture studies (Lederhouse, 1982, *Ecol. Entomol.* 7:379-383). Females of this species may well have greater relative nutrient requirements than females of more sedentary species. Puddling females may represent those cases where their requirements cannot be met from larval feeding, nectar, or the contributions of a male's spermatophore.

However, we have observed both males and females puddling singly in two related species, the black swallowtail, *Papilio polyxenes* F., and the zebra swallowtail, *Eurytides marcellus* (Cramer). The black swallowtail is not a wide-ranging species and differs considerably from the tiger swallowtail in its habitat preference and reproductive strategy (Lederhouse, 1983, *Oecologia* 59:307-311). That males puddle singly in this species may again be influenced by their territorial mating system, which involves male defense of lek sites (Lederhouse, 1982, *Behav. Ecol. Sociobiol.* 10:109-118). The observations of females puddling in these species may suggest that puddling in female Lepidoptera is more common than is widely believed.

One possible reason why female Lepidoptera are not often seen puddling in groups may be to avoid harassment by males at these sites. We have often observed the investigation of and attempted copulation with puddling individuals by new arrivals at aggregations of puddling *P. glaucus* males. A female in this situation would have to compromise between efficient puddling and exercising her reproductive choice.

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FLOWER VISITATION RECORDS FOR SNOOT BUTTERFLIES (LIBYTHEIDAE)

In the course of a general survey of libytheid butterflies (Shields, Tokurana, in press), flower visitation records were noted for *Libytheana bachmanii* Kirtland (most) and *Libythea celtis* Fuessly, gleaned from published sources and correspondence. These records are arranged here according to the classification of A. Takhtajan (1969, Flowering plants:

Origin and dispersal, Smithsonian Institution Press, Washington, D.C., 310 pp.), from primitive to advanced:

Clematis vitalba (Ranunculaceae)
Boussingaultia leptostachya (Basselaceae)
Eriogonum sp. (Polygonaceae)
Erica cinerea (Ericaceae)
Tilia sp. (Tiliaceae)
Croton sp. (Euphorbiaceae)
Rubus sp. (Rosaceae)
Prunus caroliniana (Rosaceae)
Eysenhardtia amorphoides (Leguminosae)
Melilotus albus (Leguminosae)
Philadelphus coronarius (Saxifragaceae)
Cornus sp. (Cornaceae)
Ligustrum vulgare (Oleaceae)
Baccharis sarothroides (Compositae)
Senecio douglasii (Compositae)
Chrysothamnus sp. (Compositae)
Cirsium sp. (Compositae)
Mentha sp. (Labiatae)
Sorghum sp. (Gramineae)

It is instructive to compare this list with flower visitation records for *Asterocampa* by Neck (1983, J. Lepid. Soc. 37:269-274), another nymphalid genus that utilizes *Celtis* (Celtidaceae) for larval foodplants. The only overlap in nectar feeding for both was Leguminosae and Saxifragaceae. However, *Asterocampa* adults were also reported on the fruit of *Rubus* and *Prunus* (Rosaceae), two genera that appear in the flower visits for libytheids. These facts may take on phylogenetic significance, since *Libythea celtis* uses both *Celtis australis* L. and *Prunus* as larval foodplants (Vladimir B. Polacek, *in litt.*); and Rosaceae, Leguminosae, and Saxifragaceae are closely related. A preliminary survey of flower visitation records for butterflies appears in Shields (1972, Pan-Pac. Entomol. 48:189-203).

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MALE DETERMINED MATING DURATION IN BUTTERFLIES?

When considering what factors influence the mating duration in butterflies, it is important to know to what extent it can be influenced by each sex respectively. Sims (1979, Am. Midl. Nat. 102:36-50) suggested, in analogy with results by Leopold, Terranova and Swilley (1971, J. Exp. Zool. 176:353-360) on *Musca domestica*, that mating duration probably is controlled by the female. This may be true in the sense that the female can inform the male when she is ready to terminate the copulation. However, in butterflies it is more likely that the male ultimately determines mating duration. If there should exist a conflict between the male and the female about when to terminate the copulation, the construction of the male genitalia suggests that the male alone determines copulation duration. This inference is supported by two incidental observations I have made.

The first concerns a pair of *Coenonympha pamphilus* (Satyridae), where the female was killed during copulation. On 26 August 1982 in Timmernabben, Sweden, I released